

What is claimed is:

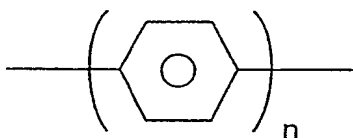
1. Patterning method with micro-contact printing comprising the steps of: applying resin on a master having projected patterns, hardening the resin and thereafter removing the hardened resin from the master to make a stamp of the resin; applying molecular ink including hydrophobic molecules dispersed in solvent on the stamp and forming micro-contact printed patterns of hydrophobic molecular layer on a substrate by means of the stamp on which the molecular ink is applied and; dipping the substrate with micro-contact printed patterns in hydrophilic molecule solution dispersed in solvent to give chemical modification to the areas of the surface of substrate around the micro-contact printed patterns, wherein solution including hydrophilic molecules having chain length shorter than the chain length of hydrophobic molecules included in the molecular ink is used as the hydrophilic molecule solution.
2. Patterning method with micro-contact printing as claimed in claim 1, wherein as the master having projected patterns used is a master having projected patterns formed on a layer of silicon or quartz or a laminate of a layer of silicon or quartz with a layer of metal or metal oxide by photolithography or the ionizing radiation lithography such as electron beam lithography or AFM lithography.
3. Patterning method with micro-contact printing as claimed in claim 1, wherein the stamp is formed applying polydimethylsiloxane on the master, hardening the polydimethylsiloxane and thereafter removing the hardened polydimethylsiloxane from the master.
4. Patterning method with micro-contact printing as claimed in claim 1, wherein as the molecular ink used is ink including any of molecule having SH group at the terminal thereof, silane coupler, or carboxylic acid, sulfonic acid, phosphonic acid, phosphoric acid or acid chloride

thereof dispersed in organic solvent such as ethanol, toluene or methylene chloride

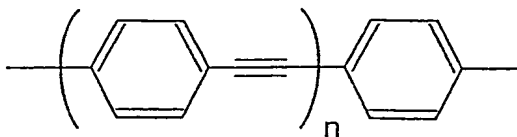
5. Patterning method with micro-contact printing as claimed in claim 1, wherein as the molecular ink used is ethanol solution of alkanethiol $\text{CH}_3(\text{CH}_2)_x\text{—SH}$.

6. Patterning method with micro-contact printing as claimed in claim 1, wherein as the molecular ink used is ink including molecules having the molecular formula represented by (X having part expressed by any of the under-mentioned structural formula (1) through (7))— $(\text{CH}_2)_n\text{—}$ (part expressed by any of the under-mentioned structural formula (1) through (7)) — $(\text{CH}_2)_m\text{—Y}$ in which m and $n \geq 0$ and X positioned at one end of the molecular formula is hydrophobic group and Y positioned at the other end of the molecular formula is a group such as —SH, —COOH, —SO₃H, —PO₃H, PO₃H₂, —COCl, —SO₂Cl, —PO₂Cl or —PO₂Cl₂ dispersed in organic solvent such as ethanol, toluene and methylene chloride.

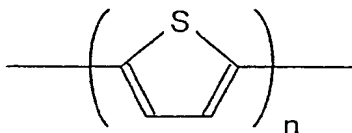
Structural formula (1)



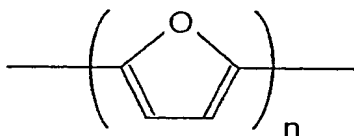
Structural formula (2)



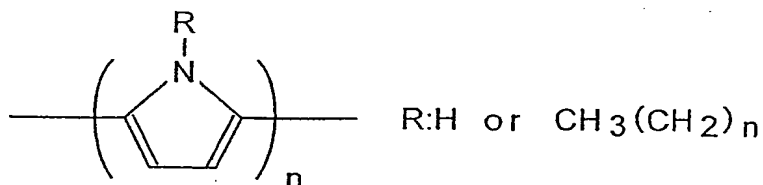
Structural formula (3)



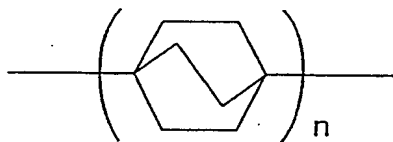
Structural formula (4)



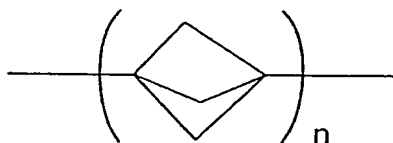
Structural formula (5)



Structural formula (6)



Structural formula (7)



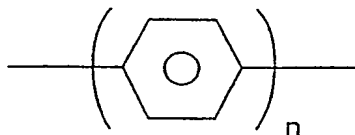
7. Patterning method with micro-contact printing as claimed in claim 1, wherein as the hydrophilic molecular solution used is solution including hydrophilic molecules having chain length shorter than the chain length of hydrophobic molecules; said hydrophilic molecules are selected from among molecules having phosphoric acid group as hydrophilic group, molecules having sulfonic acid group as hydrophilic group, molecules having amino group —NH_2 as hydrophilic group, molecules having hydroxyl group —OH as hydrophilic group or

molecules having carboxylic acid group as hydrophilic group dispersed in organic solvent such as ethanol, toluene or methylene chloride.

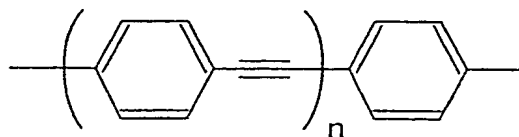
8. Patterning method with micro-contact printing as claimed in claim 1, wherein as hydrophilic molecular solution used is ethanol solution of $\text{COOH}(\text{CH}_2)_y\text{—SH}$ having the chain length shorter than the chain length of alkanethiol $\text{CH}_3(\text{CH}_2)_x\text{—SH}$.

9. Patterning method with micro-contact printing as claimed in claim 1, wherein as hydrophilic molecular solution used is solution including molecules having the molecular formula represented by (X having part expressed by any of the under-mentioned structural formulas (1) through (7)) — $(\text{CH}_2)_n$ — (part expressed by any of the under-mentioned structural formulas (1) through (7)) — $(\text{CH}_2)_m$ — Y in which m and n ≥ 0 and X positioned at one end of the molecular formula is hydrophilic group and Y positioned at the other end of the molecular formula is a group being able to be connected with substrate such as —SH, —COOH, —SO₃H, —PO₃H, —PO₃H₂, —COCl, —SO₃Cl, PO₂Cl or —PO₂Cl₂ dispersed in organic solvent such as ethanol, toluene or methylene chloride.

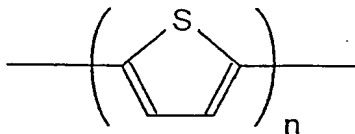
Structural formula (1)



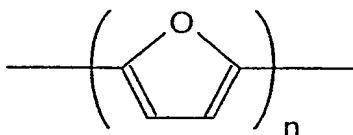
Structural formula (2)



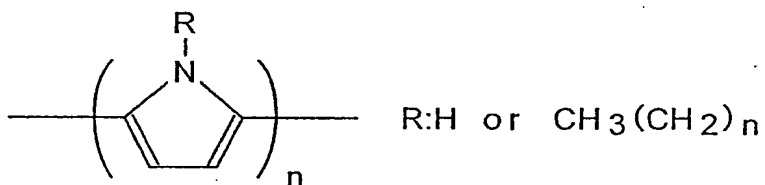
Structural formula (3)



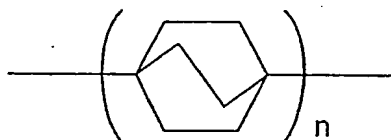
Structural formula (4)



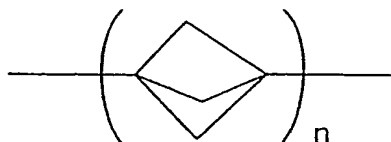
Structural formula (5)



Structural formula (6)



Structural formula (7)



10. Patterning method with micro-contact printing as claimed in claim 1, wherein molecules included in the molecular ink or the hydrophilic molecule solution are molecules having SH group at the terminal, where the surface layer of substrate is formed of gold, silver or copper.

11. Patterning method with micro-contact printing as claimed in claim 1, wherein molecules included in the molecular ink or the hydrophilic molecule solution includes silane coupler or carboxylic acid, sulfonic acid, phosphonic acid, phosphoric acid or acid chloride thereof as group connected to the substrate, where the surface layer of substrate is formed of silicon oxide or metal oxide.
12. Patterning method with micro-contact printing as claimed in any of claims 1 to 11, wherein the molecular ink is applied on the stamp by the wet inking method.
13. Patterning method with micro-contact printing as claimed in any of claims 1 to 11, wherein the molecular ink is applied on the stamp by the contact inking method.
14. Patterning method with micro-contact printing as claimed in any of claims 1 to 13, wherein micro-contact printed patterns are formed of two or more of transfer layers formed using variety of ink containing different molecules.
15. Patterning method with micro-contact printing as claimed in any of claims 1 to 14, wherein the molecular ink or the hydrophilic molecule solution is formed of polymer.
16. Patterning method with micro-contact printing as claimed in claim 1, wherein micro-contact printed patterns are formed in order of micro-contact printed patterns of hydrophobic molecules with longer chain length.
17. Printed product provided with micro-contact printed patterns of hydrophobic molecules layer formed on a substrate using molecular ink including hydrophobic molecules dispersed in solvent and with hydrophilic molecule layer formed on areas of the surface of substrate around the micro-contact printed patterns, wherein the chain length of hydrophilic molecule is shorter than the chain length of hydrophobic

molecules.

18. Printed product as claimed in claim 17, wherein the molecular ink or the hydrophilic solution is formed of polymer.

19. Printed product as claimed in claim 17, wherein parts of micro-contact printed patterns are printed in order of chain length of micro-contact printed patterns formed of hydrophobic molecules with longer chain length.

20. Patterning method with micro-contact printing comprising the steps of: applying resin on a master having projected patterns, hardening the resin and thereafter removing the hardened resin from the master to make a stamp of the resin; applying molecular ink including hydrophilic molecules dispersed in solvent on the stamp and forming micro-contact printed patterns of hydrophilic molecular layer on a substrate by means of the stamp on which the molecular ink is applied and; dipping the substrate with micro-contact printed patterns in hydrophobic molecule solution including hydrophobic molecules dispersed in solvent to give chemical modification to areas of the surface of substrate around the micro-contact printed patterns, wherein solution including hydrophobic molecules having chain length than the chain length of hydrophilic molecules included in the molecular ink is used as the hydrophobic molecule solution.

21. Patterning method with micro-contact printing as claimed in claim 1, wherein as the master having projected patterns used is a master having projected patterns formed on a layer of silicon or quartz or on a laminate of a layer of silicon or quartz with a layer of metal or metal oxide by photolithography or the ionizing radiation lithography such as electron beam lithography or AFM lithography.

22. Patterning method with micro-contact printing as claimed in claim 20, wherein the stamp is formed applying polydimethylsiloxane on a

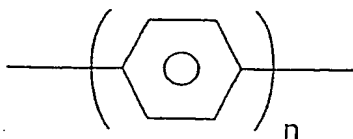
master, hardening the polydimethylsiloxane and thereafter removing the hardened polydimethylsiloxane from the master.

23. Patterning method with micro-contact printing as claimed in claim 20, wherein as the molecular ink used is ink including any of molecule selected from among molecules from among molecules having phosphoric acid group as hydrophilic group, molecules having sulfonic acid group as hydrophilic group, molecules having amino group $-\text{NH}_2$ as hydrophilic group, molecules having hydroxyl group $-\text{OH}$ as hydrophilic group or molecules having carboxylic acid group as hydrophilic group dispersed in organic solvent such as ethanol, toluene or methylene chloride.

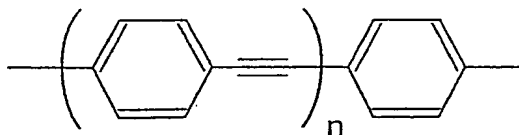
24. Patterning method with micro-contact printing as claimed in claim 20, wherein as the molecular ink used is ethanol solution of $\text{COOH}(\text{CH}_2)_y - \text{SH}$.

25. Patterning method with micro-contact printing as claimed in claim 20, wherein as hydrophilic molecular ink used is ink including molecules having the molecular formula represented by (X having part expressed by any of the under-mentioned structural formulas (1) through (7)) $-(\text{CH}_2)_n-$ (part expressed by any of the under-mentioned structural formulas (1) through (7)) $-(\text{CH}_2)_m-$ Y in which m and n ≥ 0 and X positioned at one end of the molecular formula is hydrophilic group and Y positioned at the other end of the molecular formula is a group being able to be connected with substrate such as $-\text{SH}$, $-\text{COOH}$, $-\text{SO}_3\text{H}$, $-\text{PO}_3\text{H}$, $-\text{PO}_3\text{H}_2$, $-\text{COCl}$, $-\text{SO}_3\text{Cl}$, PO_2Cl or $-\text{PO}_2\text{Cl}_2$ dispersed in organic solvent such as ethanol, toluene or methylene chloride.

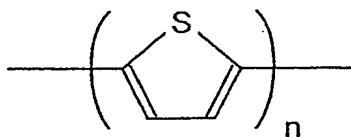
Structural formula (1)



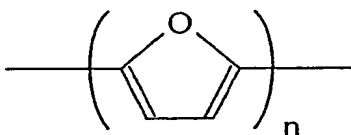
Structural formula (2)



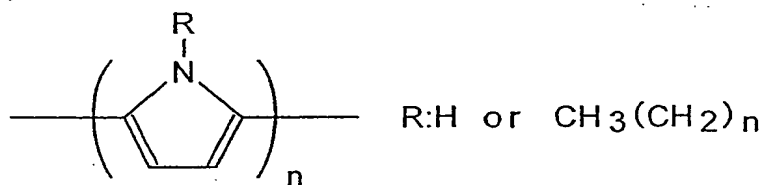
Structural formula (3)



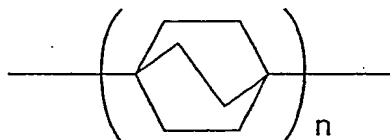
Structural formula (4)



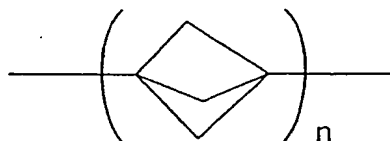
Structural formula (5)



Structural formula (6)



Structural formula (7)

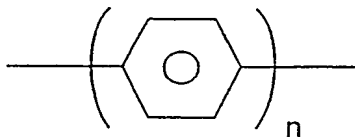


26. Patterning method with micro-contact printing as claimed in claim 20, wherein as the molecular solution used is solution including any of molecule having SH group at the terminal thereof, silane coupler, or carboxylic acid, sulfonic acid, phosphonic acid, phosphoric acid or acid chloride thereof dispersed in organic solvent such as ethanol, toluene or methylene chloride.

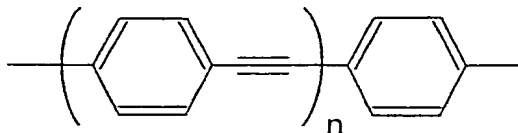
27. Patterning method with micro-contact printing as claimed in claim 20, wherein as the molecular ink used is ethanol solution of alkanethiol $\text{CH}_3(\text{CH}_2)_x\text{—SH}$.

28. Patterning method with micro-contact printing as claimed in claim 20, wherein as hydrophobic molecular solution used is solution including molecules having the molecular formula represented by (X having part expressed by any of the under-mentioned structural formulas (1) through (7)) — $(\text{CH}_2)_n$ — (part expressed by any of the under-mentioned structural formulas (1) through (7)) — $(\text{CH}_2)_m$ — Y in which m and n ≥ 0 and X positioned at one end of the molecular formula is hydrophobic group and Y positioned at the other end of the molecular formula is a group being able to be connected with substrate such as —SH, —COOH, —SO₃H, —PO₃H, —PO₃H₂, —COCl, —SO₃Cl, PO₂Cl or —PO₂Cl₂ dispersed in organic solvent such as ethanol, toluene or methylene chloride.

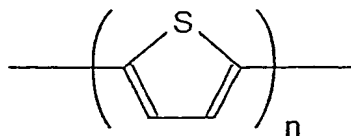
Structural formula (1)



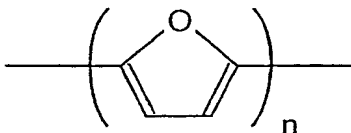
Structural formula (2)



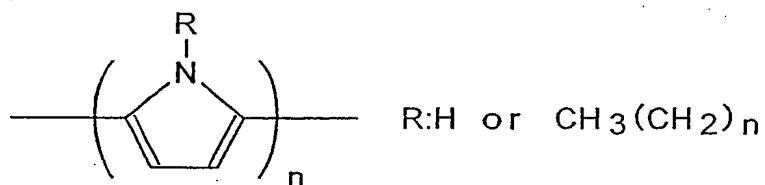
Structural formula (3)



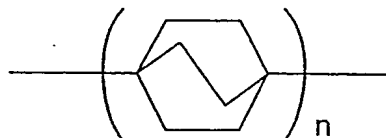
Structural formula (4)



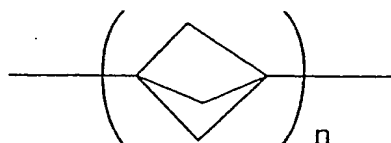
Structural formula (5)



Structural formula (6)



Structural formula (7)



29. Patterning method with micro-contact printing as claimed in claim 20, wherein molecules included in the molecular ink or hydrophobic molecule ink are molecules having SH group at the terminal thereof,

where the surface layer of substrate is formed of gold, silver or copper.

30. Patterning method with micro-contact printing as claimed in claim 20, wherein molecules included in the molecular ink or hydrophilic molecules solution are silane coupler, or carboxylic acid, sulfonic acid, phosphonic acid, phosphoric acid, or acid chloride thereof, where the surface layer of substrate is formed of silicon oxide or metal oxide.

31. Patterning method with micro-contact printing as claimed in any of claims 20 to 24, wherein the molecular ink is applied on the stamp by the wet inking method.

32. Patterning method with micro-contact printing as claimed in any of claims 20 to 24, wherein the molecular ink is applied on the stamp by the contact inking method.

33. Patterning method with micro-contact printing as claimed in any of claims 20 to 26, wherein micro-contact printed patterns are formed of two or more of transfer layers formed of using ink containing different molecules.

34. Patterning method with micro-contact printing as claimed in any of claims 20 to 26, wherein the molecular ink or hydrophobic molecule solution is formed of polymer.

35. Patterning method with micro-contact printing as claimed in any of claims 20 to 28, wherein micro-contact printed patterns are printed in order of micro-contact printed patterns formed of hydrophilic molecules with longer chain length.

36. Printed product with micro-contact printed patterns formed of hydrophilic molecule layer formed on a substrate using molecular ink including hydrophilic molecules dispersed in solvent and with hydrophobic molecules layer formed on areas of the surface of substrate around the micro-contact printed patterns, wherein the chain length of hydrophobic molecules is shorter than the chain length of hydrophilic

molecules.

37. Printed product as claimed in claim 36, wherein molecules included in the molecular ink or hydrophobic molecule solution is of polymer.

38. Printed product as claimed in claim 36, wherein parts of micro-contact printed patterns are printed in order of micro-contact printed patterns including molecules with longer chain length.

39. Patterning method with micro-contact printing comprising the steps of: applying resin on a master having projected patterns, hardening the resin and thereafter removing the hardened resin from the master to make a stamp of the resin; applying molecular ink including hydrophobic molecules dispersed in solvent on the stamp and forming micro-patterns of hydrophobic molecular layer on a substrate by means of the stamp on which the molecular ink is applied and; dipping the substrate with micro-contact printed patterns in hydrophilic molecule solution including hydrophilic molecules dispersed in solvent to give chemical modification to areas of the surface of substrate around the micro-contact printed patterns, wherein after forming the micro-contact printed patterns, chemical modification is given to the areas of the surface of substrate around the micro-contact printed patterns by the hydrophilic molecular ink in the water.

40. Patterning method with micro-contact printing as claimed in 39, wherein after giving chemical modification to the areas of the surface of substrate around the micro-contact printed patterns by hydrophilic molecular ink in the water, chemical modification is further given to the micro-patterns at the higher density to the micro-contact printed patterns in alcoholic solution.

41. Patterning method with micro-contact printing comprising the steps of: applying resin on a master having projected patterns,

hardening the resin and thereafter removing the hardened resin from the master to make a stamp of the resin; applying molecular ink including hydrophilic molecules dispersed in solvent on the stamp and forming micro-contact printed patterns formed of hydrophilic molecular layer on a substrate by means of the stamp on which the hydrophilic molecular ink is applied and; dipping the substrate with micro-contact printed patterns in hydrophilic molecule solution including hydrophilic molecules dispersed in solvent to give chemical modification to areas of the surface of substrate around the micro-contact printed patterns, wherein after forming the micro-contact printed patterns, chemical modification is given to the areas of the surface of substrate around the micro-contact printed patterns by the hydrophobic molecular ink in organic solution.

42. Patterning method with micro-contact printing as claimed in 41, wherein after giving chemical modification to the areas of the surface of substrate around the micro-contact printed patterns by hydrophobic molecular ink in organic solution, chemical modification is further given to the micro-patterns at the higher density to the micro-contact printed patterns in alcoholic solution.

43. Patterning method with micro-contact printing as claimed in any of claims 39 to 42, wherein as the master having projected patterns used is a master having projected patterns formed on a layer of silicon or quartz or a laminate of a layer of silicon or quartz with a layer of metal or metal oxide by photolithography or the ionizing radiation lithography such as electron beam lithography or AFM lithography.

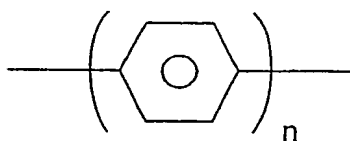
44. Patterning method with micro-contact printing as claimed in any of claims 39 to 43, wherein the stamp is formed of polydimethylsiloxane.

45. Patterning method with micro-contact printing as claimed in any of claims 39 to 43, wherein as hydrophobic molecular ink used is ink

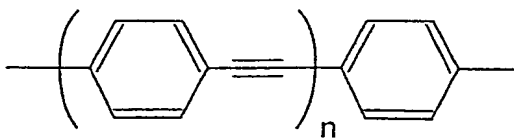
including any of molecules having SH group at the terminal thereof, silane coupler, or carboxylic acid, sulfonic acid, phosphonic acid, phosphoric acid or acid chloride thereof dispersed in organic solvent.

46. Patterning method with micro-contact printing as claimed in any of claims 39 to 42, wherein as hydrophobic molecular ink used is ink including molecules having the molecular formula represented by $(X_1 \text{ having part expressed by any of the under-mentioned structural formulas (1) through (7)}) - (CH_2)_n - (\text{part expressed by any of the under-mentioned structural formulas (1) through (7)}) - (CH_2)_m - Y$ in which m and $n \geq 0$ and X_1 positioned at one end of the molecular formula is hydrophobic group and Y positioned at the other end of the molecular formula is a group being able to be connected with substrate such as $-SH$, $-COOH$, $-SO_3H$, $-PO_3H$, $-PO_3H_2$, $-COCl$, $-SO_3Cl$, PO_2Cl or $-PO_2Cl_2$ dispersed in organic solvent such as ethanol, toluene or methylene chloride.

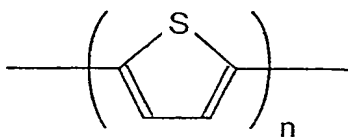
Structural formula (1)



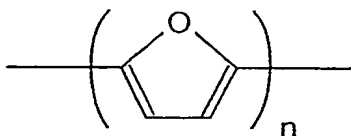
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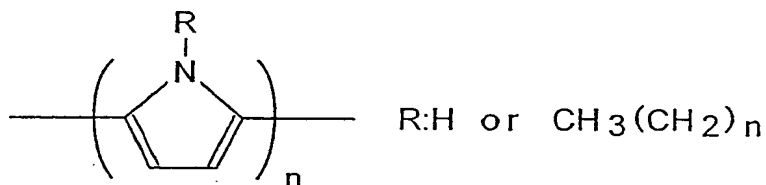
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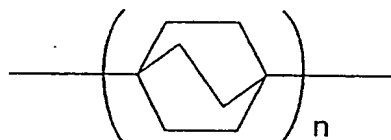
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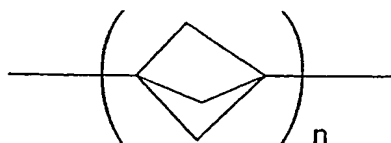
Structural formula (5)



Structural formula (6)



Structural formula (7)

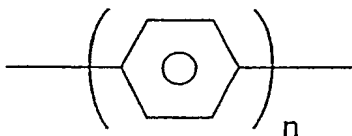


47. Patterning method with micro-contact printing as claimed in any of claims 39 to 42, wherein hydrophilic molecular ink including hydrophilic molecules dispersed in solvent used is ink including any of molecules having SH group at the terminal thereof, silane coupler, or carboxylic acid, sulfonic acid, phosphonic acid, phosphoric acid or acid chloride thereof dispersed in solvent.

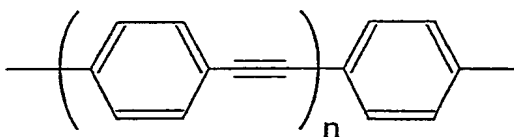
48. Patterning method with micro-contact printing as claimed in any of claims 39 to 42, wherein as hydrophobic molecular ink used is ink

including molecules having the molecular formula represented by $(X_2$ having part expressed by any of the under-mentioned structural formulas (1) through (7)) $-(CH_2)_n-$ (part expressed by any of the under-mentioned structural formulas (1) through (7)) $-(CH_2)_m-$ Y in which m and $n \geq 0$ and X_2 positioned at one end of the molecular formula is hydrophilic group and Y positioned at the other end of the molecular formula is a group being able to be connected with substrate such as $-SH$, $-COOH$, $-SO_3H$, $-PO_3H$, $-PO_3H_2$, $-COCl$, $-SO_3Cl$, PO_2Cl or $-PO_2Cl_2$ dispersed in organic solvent such as ethanol, toluene or methylene chloride.

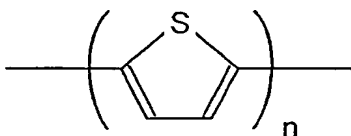
Structural formula (1)



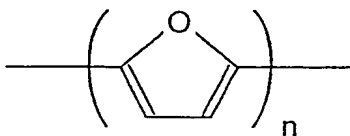
Structural formula (2)



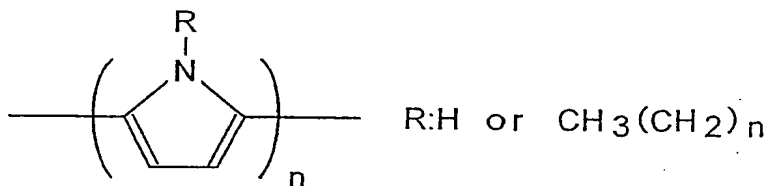
Structural formula (3)



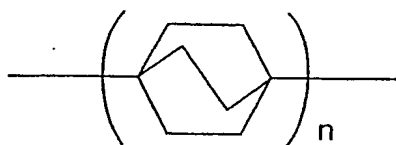
Structural formula (4)



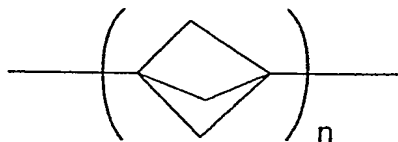
Structural formula (5)



Structural formula (6)



Structural formula (7)



49. Patterning method with micro-contact printing as claimed in any of claims 39 to 42 wherein as hydrophilic molecular ink including hydrophilic molecules dispersed in solvent used is ink including molecules positioned opposite molecules connected to substrate and selected from among molecules having phosphoric acid, molecules having phosphonic acid group, or molecules having amino group —NH_2 , molecules having hydroxyl group dispersed in solvent.

50. Patterning method with micro-contact printing as claimed in any of claims 39 to 42, wherein as the hydrophobic molecular ink including hydrophobic molecules dispersed in solvent used is ink including polymer dispersed in solvent.

51. Patterning method with micro-contact printing as claimed in any of claims 39 to 42, wherein as the hydrophilic molecular ink including

hydrophilic molecules dispersed in solvent used is ink including polymer dispersed in solvent.

52. Patterning method with micro-contact printing as claimed in any of claims 39 to 42, wherein molecules included in hydrophobic molecular ink including hydrophobic molecules dispersed in solvent are molecules having SH group at the terminal, where the surface layer of substrate on which micro-contact printed patterns are formed is formed of gold, silver or copper.

53. Patterning method with micro-contact printing as claimed in any of claims 39 to 42, wherein hydrophobic molecules included in hydrophobic molecular ink including hydrophobic molecules dispersed in solvent includes silane coupler, or carboxylic acid, sulfonic acid, phosphonic acid, phosphoric acid or acid chloride thereof, where the surface layer of substrate on which micro-contact printed patterns are formed is of silicon oxide or metal oxide.

54. Patterning method with micro-contact printing as claimed in any of claims 39 to 42, wherein molecules included in hydrophilic molecular ink including hydrophilic molecules dispersed in solvent are molecules having SH group at the terminal, where the surface layer of substrate on which micro-contact printed patterns are formed is formed is of gold, silver or copper.

55. Patterning method with micro-contact printing as claimed in any of claims 39 to 42, wherein hydrophilic molecules included in hydrophilic molecular ink including hydrophilic molecules dispersed in solvent include silane coupler, or carboxylic acid, sulfonic acid, phosphonic acid, phosphoric acid or acid chloride thereof, where the surface layer of substrate on which micro-contact printed patterns are formed is formed is of silane oxide or metal oxide.

56. Patterning method with micro-contact printing as claimed in any

of claims 39 to 42, wherein hydrophilic molecules included in hydrophilic molecular ink including hydrophilic molecules dispersed in solvent include molecules positioned at the other side against molecules connected to substrate, which molecules are selected from among molecules having phosphoric acid group, molecules having phosphonic acid group, molecules having sulfonic acid group, molecules having carboxylic acid group, molecules having amino group or molecules having hydroxyl group dispersed in solvent, where the surface layer of substrate on which micro-contact printed patterns are formed is formed is of silicon oxide or metal oxide.

57. Patterning method with micro-contact printing as claimed in any of claims 39 to 54, wherein the molecular ink is applied on the stamp by the wet inking method.

58. Patterning method with micro-contact printing as claimed in any of claims 39 to 54, wherein the molecular ink is applied on the stamp by the contact method.

59. Patterning method with micro-contact printing as claimed in any of claims 39 to 54, wherein micro-contact printed patterns are formed of two or more of transfer layers formed using a variety of ink containing different molecules.

60. Printed product provided with micro-contact printed patterns of hydrophobic molecular layer formed on a substrate using hydrophobic molecular ink including hydrophobic molecules and hydrophilic molecular layer formed on areas of the surface of substrate around the micro-contact printed patterns, wherein the printed product is produced utilizing properties of hydrophobic molecules of the micro-contact printed patterns being cohesive by cohesive connection in the water.

61. Printed product provided with micro-contact printed patterns of hydrophilic molecular layer formed on a substrate using hydrophilic

molecular ink including hydrophilic molecules and hydrophilic molecular layer formed on areas of the surface of substrate around the micro-contact printed patterns, wherein the printed product is produced utilizing properties of hydrophilic molecules of the micro-contact printed patterns being cohesive by hydrogen connection in the organic solution.

62. Printed product as claimed in claim 58 or 59, wherein the micro-contact printed patterns are formed transferring two or more of micro-contact printed patterns using molecular ink including a variety of ink containing different molecules.